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एसीटाल्डीहाईड — सुरक्षा संहिता

Indian Standard

ACETALDEHYDE — CODE OF SAFETY

ICS 71.080.80; 13.300

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Chemical Hazards Sectional Committee, CHD 007

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

Acetaldehyde is an important intermediate in the production of acetic acid, acetic anhydride, ethyl acetate, peracetic acid, chloral, alkylamines, pyridines. Acetaldehyde is a normal intermediate product in the respiration of higher plants. It occurs in traces in all ripe fruits that have a tart taste before ripening. Acetaldehyde is an intermediate product in the decomposition of sugars in the body and hence occurs in traces in blood.

In the preparation of this code of safety considerable assistance has been derived from the following publications:

a) Chemical safety data sheet SD-43, Acetaldehyde — Manufacturing Chemists Association, Washington.
b) Dangerous Properties of Industrial Materials by Irving Sax VIIIth Edition.
c) Encyclopedia of Occupational Health and Safety, ILO, Geneva.

The Composition of the committee responsible for formulation of this standard is given in Annex A.

Indian Standard

ACETALDEHYDE — CODE OF SAFETY

1 SCOPE

This standard covers properties of acetaldehyde, the nature of hazards associated with it and essential information of personal protective equipment, storage, handling, labelling, transport, spillage/leakage and waste disposal, fire prevention and fire fighting, training and health monitoring and first aid.

2 REFERENCES

The Indian Standards listed below contain provisions which through reference in this text, constitute provisions of this Indian Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Indian Standard are encouraged to investigate the possibility of applying the most recent editions of the Indian Standards indicated below:

IS No.	*Title*
4155 : 1966	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals
4167 : 1980	Glossary of terms relating to air pollution (*first revision*)
5572 : 1994	Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installation (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 4155 and IS 4167 shall apply.

4 GENERAL PROPERTIES

4.1 General Information

Colourless liquid with irritant and pungent fruity odour. Its vapours are irritating to the mucous membranes and can be specially dangerous to the eyes. It is a highly flammable chemical. Since it oxidizes, reduces, and polymerizes readily, it forms a variety of compounds. Some of these are dangerous.

4.1.1 *Common Names*

Ethanol, Acetaldehyde, Ethyl Aldehyde.

4.1.2 *Formula*: CH_3CHO

4.1.3 *CAS NO.* : 75-07-0 (Chemical Abstract Service)

4.2 Physical Properties

4.2.1 *Boiling Point*: 20.8°C.

4.2.2 *Melting Point*: – 123.5°C

4.2.3 *Specific Gravity* : (18°C/4°C) 0.783 4

4.2.4 *Vapour Density* : 1.52 (Air=1)

4.2.5 *Vapour Pressure*: 740 mm Hg at 20°C
1 120 mm Hg at 30.8°C
1 259 mm Hg at 34.4°C

4.2.6 *Physical State:*

Liquid at ordinary temperatures but rapidly volatilizes at 20.8°C.

4.2.7 *Refractive Index* (20°C): 1.311 6

4.2.8 *Miscibility*

Freely soluble in water and alcohol.

4.3 Chemical Properties

4.3.1 *Reactivity*

Extremely reactive. Easily oxidised and reduced. Violent condensation with acetic acid, acid hydrides, alcohols, anhydrous ammonia, phenol and sodium hydroxide. Violent reaction with halogens, hydrogen sulphide, ketones. Violent exothermic reaction with oxygen. Can be easily polymerized to form paraldehyde and metaldehyde. Can be regenerated from paraldehyde by mild heating in the presence of mineral acids. These reactions can be violent even in presence of traces of sulphuric acid. Acetaldehyde decomposes rubber on extended contact.

4.3.2 *Ignition Temperature in Air:* 185°C.

4.3.3 *Flash Point:* (–) 40°C (open cup)
(–) 37.77°C (closed cup)

NOTE — This varies considerably, depending upon purity of acetaldehyde.

4.3.4 *Flammable Limits in Air*: LEL : 4 percent.
UEL : 57 percent.

4.3.5 *Polymerization*

Polymerization may occur. Avoid heat, dust, strong oxidising or reducing substances, strong acids and alkalis.

4.4 Fire Hazard

Exceedingly volatile. Vapour is heavier than air and may travel a considerable distance to a source of

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ignition and flashback. It oxidises readily in the air and may form highly explosive peroxides.

4.4.1 *Electrical Hazard*

Zone 1, Class A (*see* IS 5572).

4.5 Corrosivity

In liquid state acetaldehyde is non-corrosive to most metals. It oxidises readily, however, particularly in vapour state, to acetic acid.

5 HEALTH HAZARD

5.1 Pure acetaldehyde, particularly in its vapour phase, is a local irritant in its action upon body tissues. The vapour is irritating to the eyes, nose, throat and respiratory tract. Acetaldehyde contaminated with other aldehydes such as, crotonaldehyde is more irritating than acetaldehyde alone. Leaves serious inflammation in the eyes, which may be followed by blurring of vision. Skin contact to be removed promptly. If not, the skin may become reddened and later become white and wrinkled followed by peeling of skin. Shows chronic intoxication similar to that of chronic alcoholism. However, there is no storage in the body since it is rapidly oxidised, metabolised and eliminated.

5.2 Toxicity

5.2.1 Threshold Limit Value (TLV) : 100 ppm (180 mg/m^3) (ACGIH).

5.2.2 TWA: C 25 ppm (C 45 mg/m^3) as per ACGIH.

5.2.3 Toxic Dose Level (TDL): Inhalation-human TCL_o 134 ppm 30 minutes.

5.2.4 Odour Threshold: 0.21 ppm (0.357 mg/m^3).

5.2.5 *IDLH:* 10 000 ppm

5.2.6 *Target Organs*

Respiratory system, lungs, skin, kidneys.

6 PERSONAL PROTECTION

6.1 Wear clothing to prevent repeated or prolonged skin contact.

6.2 Wear goggles to prevent any possibility of eye contact.

6.3 Employees should wash promptly when skin becomes wet.

6.4 Remove clothing immediately that becomes wet to avoid flammability hazard.

6.5 Respiratory protection is essential to prevent inhalation of gas.

6.6 Suits made of rubber, neoprene plastic to be used for complete body protection.

7 STORAGE/HANDLING

7.1 Storage

7.1.1 Stainless steel storage tanks are recommended, preferably equipped with cooling coils through which refrigerated brine may be circulated. The storage temperature should be maintained below 20°C. Large storage vessels should be fitted with temperature gauges and automatic water sprayers.

7.1.2 If stored without refrigeration, a pressure tank is required. The pressure is to be maintained by a blanket of nitrogen.

7.1.3 Acetaldehyde, particularly under pressure, should be kept away from contact with air to prevent the formation of highly explosive peroxides.

7.1.4 There is also a greater tendency to polymerize under pressure.

7.1.5 Avoid use of copper or copper alloys in tanks, lines or fittings. There is a possibility of formation of explosive copper compounds.

7.1.6 Do not use ordinary level indicators unless of parallel plate type affording protection.

7.1.7 Storage tanks should be provided with a minimum of 15 m free zone around.

7.1.8 Storage tanks and connecting lines are to be effectively grounded to guard against static charge build-up. If tank trucks are to be unloaded to drums, these also shall be grounded.

7.1.9 Defective electrical fittings should be attended to in the acetaldehyde handling area.

7.1.10 When filling a tank a dip tube extended to the bottom of the tank which is being filled will minimize splashing and static charge build-up.

7.2 Handling

7.2.1 The low boiling point of the liquid makes it difficult to handle without considerable vapour losses. To minimise this, a closed system should be used.

7.2.2 Do not apply air pressure to transfer acet-aldehyde.

7.2.3 Provision for emergency venting should be made. Vent should be connected to a scrubber of a flare system.

7.2.4 Wear chemical goggles, respiratory protective devices such as, canister type masks, airline mask, depending on the situation. Use of barrier cream on hands and exposed parts of the body is recommended.

7.2.5 Due to polymerization choking of equipments, lines, relief devices etc, is possible. These are to be inspected and cleaned regularly.

7.2.6 Acetaldehyde drums should be opened only after thorough cooling below 20°C.

7.2.7 Adequate ventilation shall be provided in the acetaldehyde handling area to keep concentration well below 100 ppm. Water showers and eye wash fountain systems shall also be provided in this area.

7.2.8 In acetaldehyde handling plants, jumpers should be used on the flanged lines for electrical continuity. Insulation should be used in vessels and pipelines to keep acetaldehyde cool. Special seals should be provided in the centrifugal pump. Safety valves or rupture discs should be used in the process vessels for protection against high pressure.

7.2.9 Material Safety Data Sheet (MSDS) should be available at the sites handling acetaldehyde.

7.2.10 The container should be labelled as per rules and regulations for transportations of hazardous chemicals.

7.3 Transportation

7.3.1 Acetaldehyde is highly flammable and its UN Number is 1089, UN hazard class 3 and EAC (Hazchem Code - 2YE).

7.3.2 *The Rules and Regulations* for transportation of hazardous chemicals shall be adhered to.

8 SPILLAGE/LEAKAGE AND DISPOSAL

8.1 Absorb the minor spills with rags or other available absorbing materials. Evaporate in hood and dispose by burning the rags or the absorbing material.

8.2 Spillage may be flushed away with water.

8.3 Care must be taken to prevent the accumulation of acetaldehyde vapour in sewers where it can form an explosive mixture with air.

8.4 Adequate water and drainage facilities should be provided in acetaldehyde handling areas.

9 FIRE PROTECTION AND FIRE FIGHTING

9.1 Acetaldehyde is highly flammable and highly volatile.

9.2 Protect from ignition sources such as, open fires, static discharges, defective electrical wiring or equipment. Use nonsparking tools.

9.3 Acetaldehyde is soluble in water in all proportions. Adequate fire water system afford the best protection against fires.

9.4 Flooding with water will dilute the acetaldehyde to the point where it will not support combustion.

10 TRAINING AND HEALTH MONITORING

10.1 Training

10.1.1 Employees should be familiar with its flammable and explosive properties.

10.1.2 The dangers of peroxide formation should be stressed.

10.1.3 Continuous training and re-training should be done in the safe handling procedures.

10.1.4 Demonstration on the volatility of acetaldehyde liquid has to done to the workers.

10.2 Health Monitoring

10.2.1 During pre-employment medical examination the following conditions should be checked:

a) Chronic skin conditions or chronic inflammatory condition of the eyelids.
b) Diseases of the upper respiratory tract or lungs.
c) Only one eye.
d) Uncorrected severe faulty vision.

Such persons should be excluded from processes involving acetaldehyde handling.

10.2.2 Periodical medical examination should include *inter-alia*, examination of target organs.

11 FIRST AID

11.1 Eye Contact

11.1.1 If acetaldehyde gets into the eyes immediately wash the eyes with large quantity of water for at least 15 minutes, occasionally lifting the lower and upper lids.

11.1.2 Get medical attention immediately.

11.1.3 Contact lenses should not be used when working with this chemical.

11.2 Skin Contact

11.2.1 If acetaldehyde gets on the skin, flush the contaminated skin with water.

11.2.2 If it soaks through the clothing, immediately remove the clothing and flush the skin with water.

11.2.3 If irritation persists after washing, get medical attention.

11.3 Inhalation

11.3.1 Move the exposed person to fresh air immediately and administer oxygen if available.

11.3.2 If breathing has stopped, give artificial respiration.

11.3.3 Keep the affected person warm and at rest.

11.3.4 Get medical attention as soon as possible.

11.4 Ingestion

11.4.1 If acetaldehyde has been swallowed and the person is conscious, immediately give large quantity of water to drink.

11.4.2 After the water has been swallowed, make the person to vomit by having him touch the back of his throat with his finger.

11.4.3 Do not give anything by mouth to an unconscious person nor induce to vomitting.

11.4.4 Get medical attention immediately.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Hazards Sectional Committee, CHD 007

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Joint Director (Chem), BIS

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